

We claim

- 5 1. A method of multiple work stations collaborating on a shared data structure stored on a server, the server being configured and controlled for multiple user access to and manipulation of shared data structures, said method comprising:
  - a. opening an application to access or create the shared data structure;
  - b. connecting to the server;
  - 10 c. operating on the shared data structure on a remote work station;
  - d. invoking a wrapper for the changes to the shared data structure;
  - e. encapsulating the operations on the shared data structure into one or more messages;
  - f. sending the messages to the server;
  - 15 g. entering the changes in the shared data structures on the server; and
  - h. reflecting the entered changes to other client work stations connected to the server.
- 20 2. The method of claim 1 wherein the method is carried out in real time.
3. The method of claim 1 wherein the shared data structure is chosen from the group consisting of conference white boards, presentations, agendas, spread sheets, and documents.
- 25 4. The method of claim 1 wherein the server is configured and controlled for multiple user access to and manipulation of shared data structures in accordance with the Document Object Model.

- 5       The method of claim 1 comprising connecting to the server through at least one API.
6.       The method of claim 1 comprising connecting to the server and connecting to a  
5       namespace on the server associated to the shared data structure.
7.       The method of claim 1 wherein the server monitors operations on the shared data structure on the work stations in real time.
- 10      8.       The method of claim 7 comprising:  
a.       detecting a change in a data structure on a client work station; and  
b.       invoking a wrapper, encoding the operation.
9.       The method of claim 1 comprising manipulating and modeling an XML mark-up  
15       language file in accordance with the Document Object Model.
10.      The method of claim 9 wherein the shared data structure complies with an XML data model.  
20
11.      The method of claim 9 comprising synchronizing data structures to individual client work stations.
- 25      12.      The method of claim 9 comprising creating DOM objects from a wrapped DOMImplementation application.
13.      The method of claim 9 comprising applying a plurality of document changes as one atomic unit.

30

14. The method of claim 9 comprising wrapping underlying DOM applications in a wrapper as nodes.
15. The method of claim 14 wherein each node is an object in the DOM model.
- 5 16. The method of claim 15 wherein sub-nodes inherit from the nodes.
17. The method of claim 16 wherein the sub-nodes are chosen from the group consisting of documents, elements of a document, and attributes of an element.
- 10 18. The method of claim 17 wherein each node in a DOM file on a local work station is associated to an object in a shared node on the server.
19. The method of claim 18 wherein a shared node wraps a local node.
- 15 20. The method of claim 19 wherein each node has a unique user ID.
21. The method of claim 20 wherein the shared node is aware of parent node ID.
- 20 22. The method of claim 20 wherein the shared node is aware of the document ID.
23. The method of claim 20 wherein the shared node is aware of the namespace.
24. The method of claim 19 wherein a shared node wraps a local node.
- 25 25. The method of claim 21 wherein the local node uses the shared node as a delegate for operations.
26. The method of claim 1 comprising detecting a change by an application to the
- 30 DOM model.

27. The method of claim 26 wherein the changes invoke a wrapper.
28. The method of claim 24 comprising detecting a change on a local DOM model,  
5 and encoding the detected change.
29. The method of claim 28 comprising encoding the detected change on the client,  
transmitting the detected change to the server, and implementing the change on the  
server.  
10
30. The method of claim 29 comprising synchronously applying the change on the  
server and reflecting the change to the clients.
31. A program product comprising computer readable code to configure and control a  
15 collaborative process in a system comprising multiple work stations collaborating on a  
shared data structure stored on a server, the server being configured and controlled for  
multiuser access to and manipulation of the shared data structures, by a method  
comprising:  
a. opening an application to access or create the shared data structure;  
20 b. connecting to the server;  
c. operating on the shared data structure a remote work station;  
d. invoking a wrapper for changes to the shared data structure;  
e. wrapping the operations on the shared data structure into one or more wrappers;  
f. sending the wrapped changes to the server;  
25 g. entering the changes in the shared data structure on the server;  
h. reflecting the entered changes to other client work stations connected to the  
server.
32. The program product of claim 31 wherein the method is carried out in real time.  
30

33. The program product of claim 31 wherein the shared data structure is a markup language file.

5 34. The program product of claim 33 wherein the markup language file is an XML file.

35. The program product of claim 33 wherein the mark-up language file is chosen from the group consisting of conference white boards, presentations, agendas, spread sheets, and documents.

10

36 The program product of claim 31 wherein the method comprises connecting to the server through at least one API.

15 37. The program product of claim 31 wherein the method comprises connecting to the server and connecting to a namespace on the server associated to the shared data structure.

38. The program product of claim 31 wherein the method comprises the server monitoring operations on the mark-up language file on the work stations in real time.

20

39. The program product of claim 38 comprising instructions for:

- a. detecting a change in a data structure on a client work station; and
- b. invoking a container, encoding the operation.

25 40. The program product of claim 31 wherein the method comprises manipulating and modeling the shared data structure in accordance with the Document Object Model.

41. The program product of claim 40 wherein the method comprises synchronizing data structures to individual client work stations.

30

42. The program product of claim 40 wherein the method comprises creating DOM objects from a wrapped DOMImplementation application.
43. The program product of claim 40 wherein the method comprises applying a  
5 plurality of document changes as one atomic unit.
44. The program product of claim 40 wherein the method comprises wrapping underlying DOM applications in containers as nodes.
- 10 45. The program product of claim 44 wherein each node is an object in the DOM model.
46. The program product of claim 45 wherein sub-nodes inherit from the nodes.
- 15 47. The program product of claim 46 wherein the sub-nodes are chosen from the group consisting of documents, elements of a document, and attributes of an element.
48. The program product of claim 47 wherein each node in a DOM on a local work station is associated to an object in a shared node on the server.
- 20 49. The program product of claim 48 wherein a shared node encapsulates a local node.
50. The program product of claim 49 comprising instructions for assigning each node  
25 has a unique user ID.
51. The program product of claim 50 wherein the shared node is aware of the parent node ID.

52. The program product of claim 50 wherein the shared node is aware of the document ID.

53. The program product of claim 50 wherein the shared node is aware of the namespace.

54. The program product of claim 53 comprising instructions for causing a shared node to wrap a local node.

55. The program product of claim 54 comprising instructions for causing a local node to use the shared node as a delegate for operations.

56. The program product of claim 31 comprising instructions for detecting a change by an application to the DOM model.

57. The program product of claim 56 wherein the changes invoke a wrapper.

58. The program product of claim 54 comprising instructions for detecting a change on a local DOM model, and encoding the detected change.

59. The program product of claim 58 comprising instructions for encoding the detected change on the client, transmitting the detected change to the server, and implementing the change on the server.

60. The program product of claim 59 comprising instructions for applying the change on the server, and reflecting the change to the clients.

61. A system including a server and a plurality of clients connected to the server for collaboration on a shared data structure stored on the server,

- a. the server being configured and controlled for multiuser access to and manipulation of shared data structures,
  - b. the client being configured and controlled to
    - i. operate on the shared data structure at a remote work station;
    - 5 ii... invoke a wrapper for the changes to the shared data structure;
    - iii. encapsulate the operations on the shared data structure into the wrapper; and
    - iv. send the encapsulated changes to the server;
  - c. the server being configured and controlled to
    - 10 i. enter the changes in the shared data structure thereon; and
    - ii.. reflect the entered changes to other clients connected to the server.
62. The system of claim 61 wherein the system operates in real time.
- 15 63. The system of claim 61 wherein the shared data structure is a markup language file.
64. The system of claim 63 wherein the markup language file is an XML file.
- 20 65. The system of claim 63 wherein the markup language file is from the group consisting of conference white boards, presentations, agendas, spread sheets, and documents, on the clients.
66. The system of claim 61 wherein the server associates a shared data structure to a  
25 namespace.
67. The system of claim 61 wherein the server:
  - a. monitors operations on the shared data structure at a client in real time;
  - b. detects changes in the shared data structure at the client; and
  - 30 c. invokes a wrapper, and encodes the operation.



68. The system of claim 67 wherein the server is configured and controlled to manipulate and model the shared data structure in accordance with the Document Object Model.

5

69. The system of claim 68 wherein the server is configured and controlled to synchronize data structures to individual clients.

70. The system of claim 68 wherein the system is configured and controlled to create  
10 DOM objects from a wrapped DOMImplementation application.